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First illustrated report of *Batocera lineolata* Chevrolat, 1852 (Cerambycidae, Lamiinae, Batocerini) from India

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Abstract
We report *Batocera lineolata* Chevrolat, 1852, based on four records, from Manipur and Nagaland states in Northeast India. These records are the first time this species has been found in India. We also provide a brief redescription of *B. lineolata*.

Keywords
First records, long-horned beetles, Northeast India

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Introduction

The genus *Batocera* Dejean, 1835 belongs to Batocerini Thomson, 1864 (Cerambycidae, Lamiinae) and can be distinguished from other tribe genera by spinously rugose antennae (Gilmour and Dibb, 1948) and by characters such as moderate (more than 25 mm body length) to large body (more than 55 mm body length), antennae very long (sometimes three times as long as body in male) and robust, scape with a distinct cicatrix and the third antennal segment much longer than the fourth. This genus contains around 55 described species, some widely distributed (Ślipiński and Escalona 2013), while others are restricted to certain areas. For example, *Batocera rufomaculata* (De Geer, 1775) is widespread throughout almost the entire Old-World tropics while *B. lineolata* Chevrolat, 1852 and *B. horsfieldi* (Hope, 1839) are found only in the Oriental region, and *B. andamana* Thomson, 1878 is endemic to the Andaman and Nicobar Islands. In this study, specimens collected from Manipur and Nagaland, in NE India (Fig. 1), were identified as *Batocera lineolata* Chevrolat, 1852 based on keys by Gilmour and Dibb (1948). There are no other recent keys available to identify species under this genus. We have also compared the images of the holotype of this species and closely related *B. horsfieldi* which further helped us in settling the identity of the species. According to keys by Gilmour and Dibb (1948), the two species can be differentiated on the basis of granules or tubercles at the basal region of elytra. In *B. horsfieldi* these tubercles are large and fairly well spaced, while in *lineolata* they are closer and smaller. *Batocera horsfieldi* is also said to be broader, and the ground colouration is more completely grey. Gilmour and Dibb (1948) gave the size ranges for these two species: *B. horsfieldi* 45–57 mm long by 15–23 mm wide, and *B. lineolata* 41–73 mm long by 12–22 mm wide.

Several early reports on long-horned beetles mentioned the presence of *B. lineolata* in India but did not

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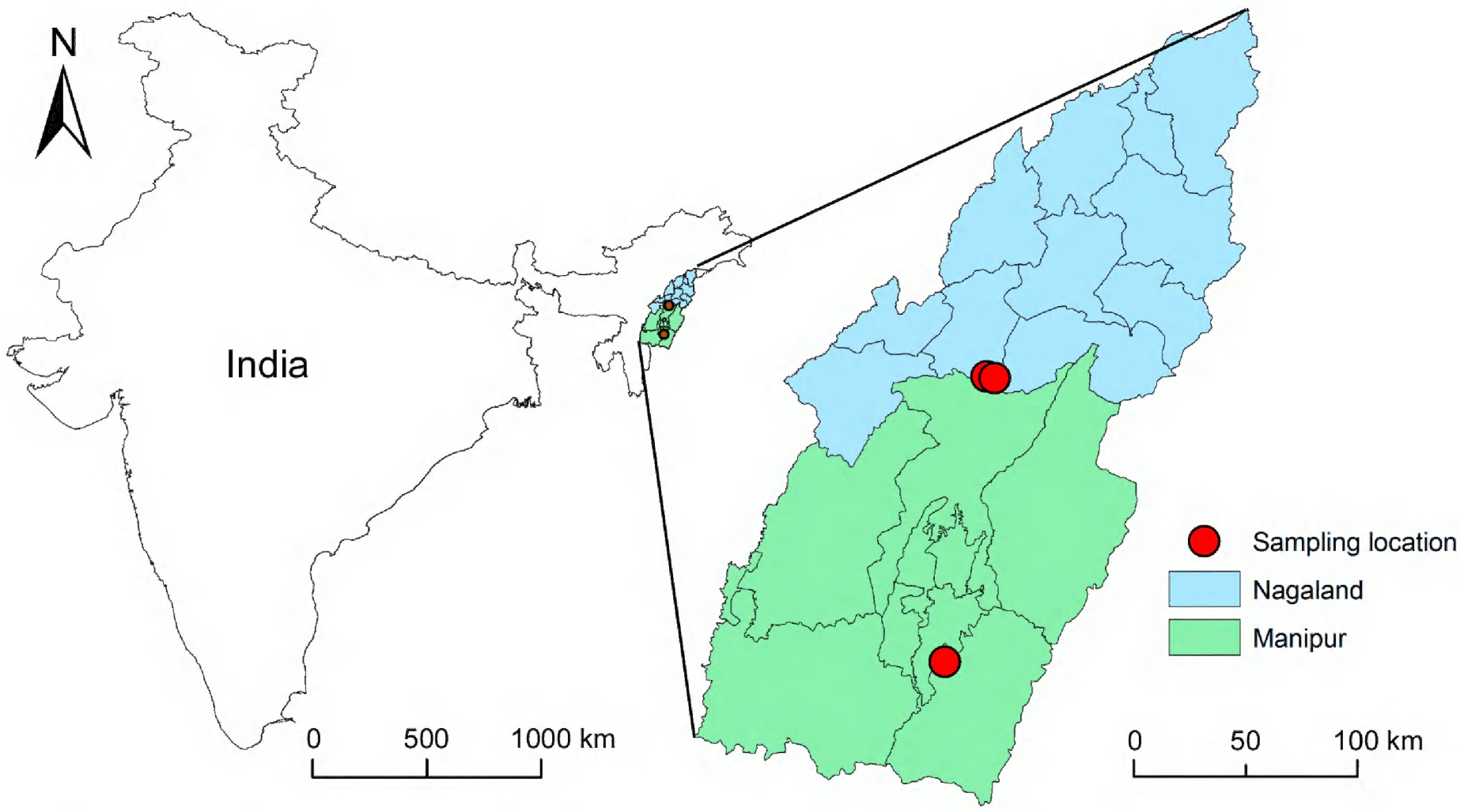

Figure 1. Map showing the sampling sites of *Batocera lineolata* in Nagaland and Manipur states, India.

provide any diagnostic characters (Chen et al. 1959; Mukhopadhyay and Biswas 2000; Mitra et al. 2016, 2017). Some of of the early literature has listed *Batocera lineolata* var. *adelpha* from various states of Northeast India, but this "variety" is now treated as a synonym of *B. horsfieldi,* as discussed by Gilmour and Dibb (1948). Perhaps for the same reasons, *Batocera lineolata* (type locality: China) is not included in the latest checklist of Indian Cerambycidae by Kariyanna et al. (2017) who included 11 well-known and one doubtful or poorly known species, *Batocera? sentis* (Linnaeus, 1758) . Thus, we present the first illustrated report of *B. lineolata* from India. Here we redescribe *B. lineolata* with illustrations of its habitus and other features, including male genitalia.

Methods

Beetles were collected by hand, preserved in 70% ethanol, and subsequently pinned. The specimens were collected in Manipur and Nagaland states. They were photographed under a Keyence digital microscope VHX-6000 and studied under a Leica SMZ6 stereo zoom microscope. The images were edited using Photoshop CS5 (Adobe Systems). We followed Kolla et al. (2019) for preparation of male genitalia. For parameres, the photographs were captured on a microscope using an attached mobile camera. The specimens are maintained at ATREE Insect Museum, Bangalore (AIMB; the "[E] in each accession number stands for "Edible").

Results

Subfamily Lamiinae Latreille, 1825
Tribe Batocerini Thomson, 1864
Genus *Batocera* Dejean, 1835

***Batocera lineolata* Chevrolat, 1852**
Figures 2, 3

New records. INDIA • 1 ♂, Manipur State, Chandel, 24° 25′09″N, 093°58′44″E, 868 m elev.; 6 Feb. 2019; leg. Barkha Subba; AIMB/CO/CER 000001[E]. • 1 ♀, Manipur State, Chandel, 24°25′09″N, 093°58′44″E, 868 m elev.; 6 Feb. 2019; leg. Barkha Subba; AIMB/CO/CER 000002[E]. • 1 ♀, Nagaland State, Kohima, 25°33′29″N, 094°10′46″E, 1543 m elev.; 12 Apr. 2019; leg. Aavika Dhanda; AIMB/CO/CER 000003[E]. • 1 ♂, Nagaland State, Kohima, 25°33′29″N, 094°10′46″E, 1543 m elev.; 19 May 2019; leg. Aavika Dhanda; AIMB/CO/CER 000004[E].

Redescription.

Diagnosis—Body elongate, narrow, sub-cylindrical; integument black with patches of white or yellowish white tomentose pubescence as well as very fine dense, adpressed greyish pubescence all over the body; antennae with sparse long black setae (Fig. 2A). Laterally with a large broad band of white, dense setae from head to thoracic sterna, this band is broken in elongate oval patches on lateral margin of abdominal ventrites (Fig. 2B).

Male—Head: hypognathous antennal tubercles strongly elevated with a deep groove between them; eyes large, squarish from front; upper lobe of eye extending dorsally and slightly short on median sulcus on vertex, narrowest dorsal region of eye with about seven ommatidia; frons trapezoidal, sparsely punctured, with yellowish brown pubescence; frons with thin median sulcus extending back throughout on vertex. Clypeus with distal half coriaceous shining, smooth. Labrum densely covered with pubescence and four long setae, distal margin with golden pubescence. Mandibles strong, curved

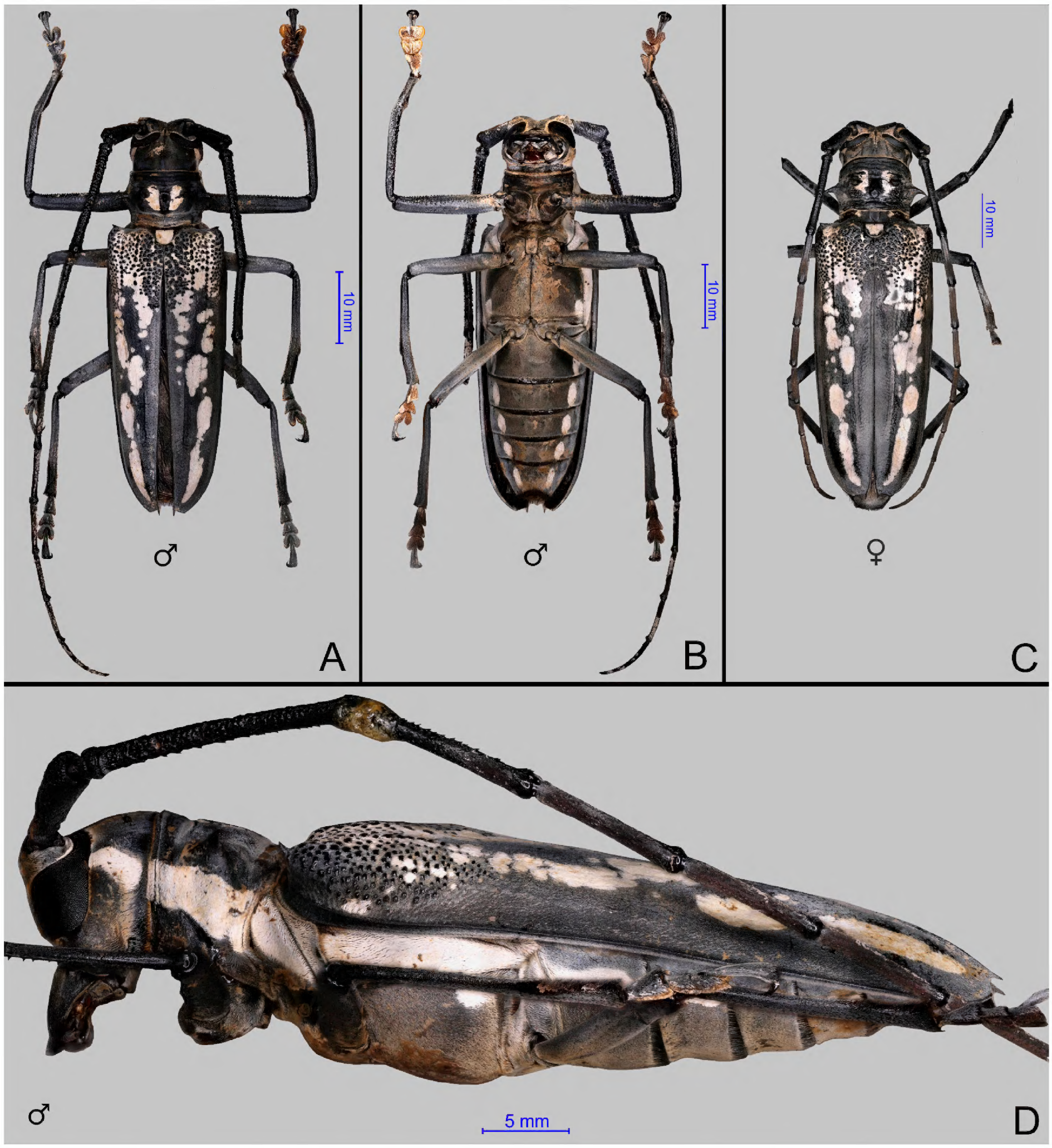

Figure 2. *Batocera lineolata*. **A.** Dorsal view of male. **B.** Ventral view of male. **C.** Dorsal view of female. **D.** Lateral view of male.

in distal half, covered with pubescence in basal half and shining black in distal half; each mandible strongly pointed apically; both labial and maxillary palp dark black with fine pubescence (Fig. 3A, C). Vertex smooth, without granules, slightly tumescent, and with fine scattered punctures. Antennae long, robust, scape distinctly enlarged apically and with apical cicatrix, rugose, covered with deep punctures and sparse white setae, antennomere III with short white setae, and long black sparse setae, strongly rugose and punctate, ventrally (or underside) with spiniform tubercles. Gular area with fine punctures and dense white setae; basal parts of maxilla and labium shining smooth and pale brown; basal segment of both palps partly pale cream at base.

Thorax: pronotum broader than long, anterior margin straight, posterior margin sinuate and lateral margin with strong, sharp, backwardly directed spines with a very broad base which is granular in posterior part; apex of the spine shining, smooth, rest of the area partly covered by whitish setae (Fig. 3B). One prominent, deep transverse sulcus behind anterior margin and two transverse sulci before posterior margin. A median shallow longitudinal sulcus on discal part, not reaching anterior and posterior margin. A shining and nearly smooth median oval area on disc, bordered by a patch of pubescence on each side. Prosternal area in front of procoxae transversely finely wrinkled; prosternal process narrowed between procoxae, its margin raised, process distally broadened.

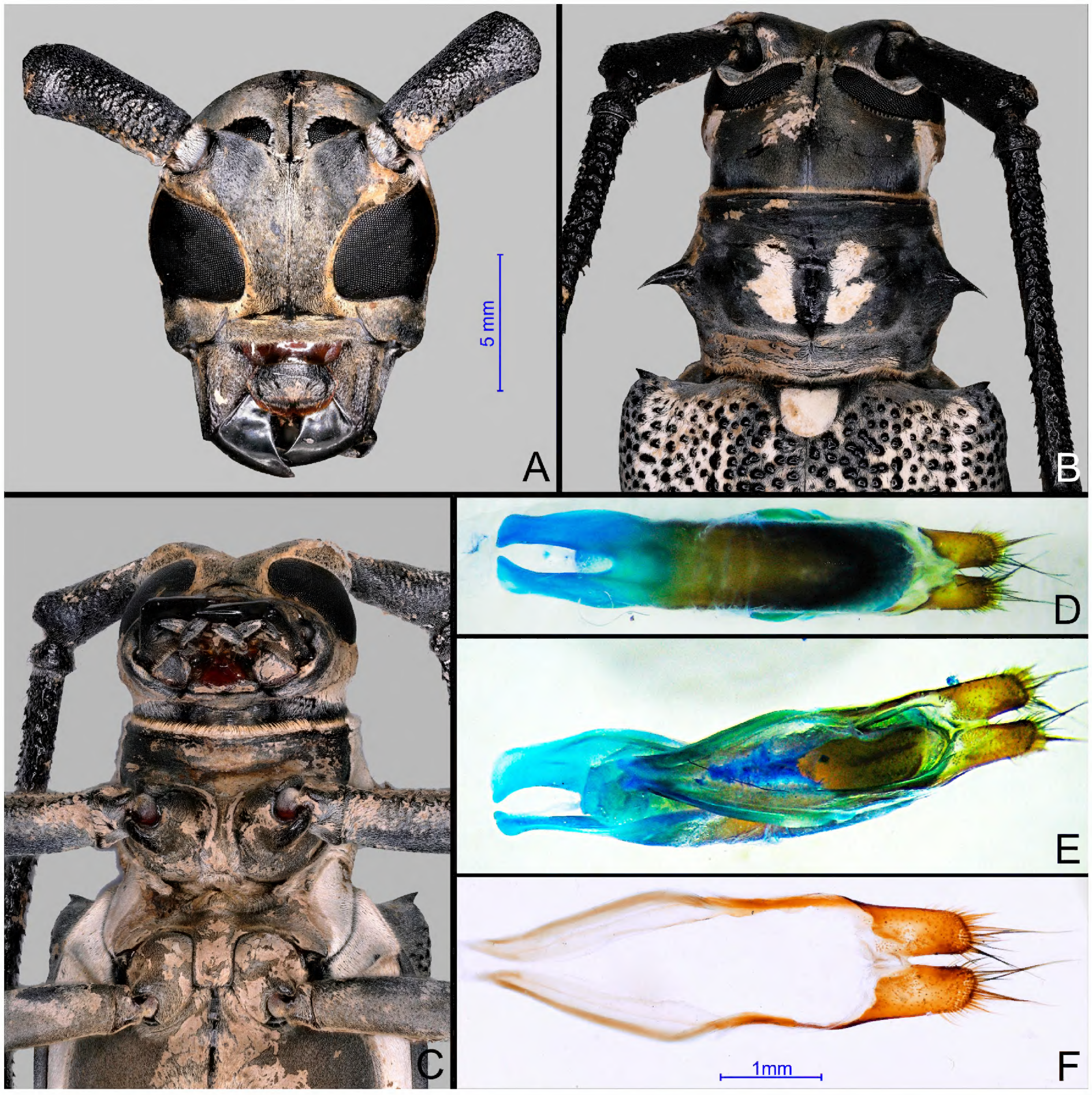

Figure 3. *Batocera lineolata*. **A.** Head in front view. **B.** Dorsal view of pronotum. **C.** Ventral view of thorax. **D, E.** Male genitalia in dorsal and ventral view respectively. **E.** Paramere in dorsal view.

Mesoventrite broad with a tongue like mesoventral process extending between mesocoxae; metaventrite broad, with short metaventral process reaching anteriorly to the mesoventral process and with strong median longitudinal sulcus; metaventral surface densely covered with grayish white, sparse, adpressed setae, except at posterior outer corner where there is a white, very dense, oval tomentose patch (Fig. 3C). Entire lateral margin of thorax covered with a very dense white patch (Fig. 2D).

Elytra: each elytron elongate, narrow, broad at humerus, gradually narrowing towards apex; its basal area covered with shining black, smooth, flattish tubercles and granules; finely sculptured, with sparse punctures masked by setae, with pattern of white tomentose patches masking all the elytral architecture. Humeral angles sharp with a prominent spine, which is almost vertically oriented upwards. Humeral granules larger at base, densely arranged, gradually becoming smaller distally, with irregular rows each with 12 to 14 granules. Elytral apex truncate with prominent sutural spine but outer angle obtuse. Scutellum tongue-shaped, densely covered with white pubescence.

Legs: all legs laterally compressed, robust. In male, profemora ventrally densely granular and spiny; protibia slightly broadened and curved in apical region and slender and longer than femora; all tarsi with four visible segments; claw separated at 180 degrees.

Abdomen: with five ventrites. Each segment with transverse shining smooth area on distal fifth, whereas all basal area moderately densely pubescent. Colour of pubescence grayish white with few long, dark setae present at limit between pubescent and smooth area. Ventrite I longest, II to IV subequal in length, V longer than the preceding and more narrowed towards apex. Male

genital aperture wide, densely covered with dark brown and black setae.

Male genitalia: moderately robust, about 6.5 mm long aedeagus, with moderately curved median struts (Fig. 3D, E); endophallus without any strong sclerotized spicules or spines, tegmen short, parameres apically setose (Fig. 3F).

Female—Similar to male, except antennae shorter, smooth, without rugulations and strong spines; profemora and protibiae nearly smooth underneath (Fig. 2C).

Discussion

The examined specimens of *Batocera lineolata* reported in this study matched closely the available description and images of the holotype. Genitalia of only a couple of *Batocera* species from India are described and illustrated (Surulivelu and Subramaniam 1977), and hence we have included photographs of male genitalia of *B. lineolata*, which match well with the line drawing given by Ehara (1954) for this species.

According to Pascoe (1866), who wrote the descriptive catalogue of cerambycid beetles collected by A.R. Wallace in the Malay Archipelago, *Batocera* is one of the most difficult genera to identify "owing to various modifications of colour … in many cases it is impossible to distinguish them without the aid of a suit of specimens" (Pascoe 1866: 261). Gilmour and Dibb (1948) first presented a comprehensive revision of the tribe Batocerini that includes the genus *Batocera* and gave a detailed description of the genus, included every species and subspecies known at that time, and provided a key. The key characters that separate *B. lineolata* from *B. horsfieldi* are already pointed out above. Furthermore, Rigout (1988) gave illustrations of almost all members of the tribe Batocerini, including *B. lineolata* and *B. horsfieldi*. However, Ślipiński and Escalona (2013) have noted that many species of *Batocera* are widely distributed and the species boundaries are difficult to establish. Perhaps molecular work may help to conclusively resolve such issues.

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Authors' Contributions

BS collected the specimens and made the map. HVG and SSB prepared the first draft of the manuscript. SSB took photographs and prepared the figures. PDR and BS reviewed and finalized the manuscript.

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